GBDO /2277

RECD 13 JUL 2000

WIPO PCT

INVESTOR IN PEOPLE

4

GB00/2277

The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

PRIORITY DOCUMENT

SUBMITTED OR TRANSMITTED IN COMPLIANCE WITH RULE 17.1(a) OR (b)

10/018414

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.

Signed

Dated: 4 July 2000

For official use

THE PATENT OFFICE
C
15 JUN 1999
LONDON

15 JUN 1999

16JUN99 E454962-1 D03312
P01/7700 0.00 - 9913952.9

Your reference 230P80667

9913952.9

Notes
Please type, or write in dark ink using CAPITAL letters. A prescribed fee is payable for a request for grant of a patent. For details, please contact the Patent Office (telephone 071–438 4700).

Rule 16 of the Patents Rules 1990 is the main rule governing the completion and filing of this form.

The Patent Office — Request for grant of a Patent

Form 1/77

Patents Act 1977

❶ Title of invention

1 Please give the title of the invention: LOAD CARRYING BODY

❷ Applicant's details

❷ Do not give trading styles, for example, 'Trading as XYZ company', nationality or former names, for example, 'formerly (known as) ABC Ltd' as these are not required.

❑ **First or only applicant**

2a If you are applying as a corporate body please give:

Corporate name: Multidrive Limited

Country *(and State of incorporation, if appropriate)*: United Kingdom

2b If you are applying as an individual or one of a partnership please give in full:

Surname

Forenames

2c **In all cases**, please give the following details:

Address: Thirsk Industrial Park
York Road, Thirsk,
North Yorkshire YO7 3BX
United Kingdom

UK postcode *(if applicable)*

Country

ADP number *(if known)*

Warning
After an application for a Patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977 and will inform the applicant if such prohibition or restriction is necessary. Applicants resident in the United Kingdom are also reminded that under Section 23, applications may not be filed abroad without written permission unless an application has been filed not less than 6 weeks previously in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction revoked.

2d, 2e and 2f: If there are further applicants please provide details on a separate sheet of paper.

Second applicant ***(if any)***

2d If you are applying as a corporate body please give:

Corporate name

Country *(and State of incorporation, if appropriate)*

2e If you are applying as an individual or one of a partnership please give in full:

Surname

Forenames

2f **In all cases**, please give the following details:

Address

UK postcode *(if applicable)*

Country

ADP number *(if known)*

❸ *An address for service in the United Kingdom must be supplied*

Please mark correct box

❸ Address for service details

3a Have you appointed an agent to deal with your application?

Yes [X] No [ ] ➡ ***go to 3b***

⬇ ***please give details below***

Agent's name: Marks & Clerk

Agent's address: 57-60 Lincoln's Inn Fields
LONDON
WC2A 3LS.

Postcode

Agent's ADP number: 18001

3b: *If you have appointed an agent, all correspondence concerning your application will be sent to the agent's United Kingdom address.*

3b If you have not appointed an agent please give a name and address in the United Kingdom to which all correspondence will be sent:

Name

Address

Postcode

Daytime telephone number *(if available)*

ADP number *(if known)*

❹ Reference number

4 Agent's or applicant's reference number *(if applicable)*

230P80667

❺ Claiming an earlier application date

5 Are you claiming that this application be treated as having been filed on the date of filing of an earlier application?

Please mark correct box

Yes ☐ No ☒ ➡ ***go to 6***

⬇

please give details below

❑ number of earlier application or patent number

❑ filing date

(day month year)

❑ and the Section of the Patents Act 1977 under which you are claiming:

Please mark correct box

15(4) (Divisional) ☐ 8(3) ☐ 12(6) ☐ 37(4) ☐

❻ Declaration of priority

❻ *If you are declaring priority from a PCT Application please enter 'PCT' as the country and enter the country code (for example, GB) as part of the application number.*

Please give the date in all number format, for example, 31/05/90 for 31 May 1990.

6 If you are declaring priority from previous application(s), please give:

Country of filing	Priority application number *(if known)*	Filing date *(day, month, year)*

⑦ *The answer must be 'No' if:*
O any applicant is not an inventor
*O there is an inventor who is not an applicant, **or***
O any applicant is a corporate body.

⑦ Inventorship

7 Are you (the applicant or applicants) the sole inventor or the joint inventors?

Please mark correct box

Yes ☐ No ☒ ⇨ ***A Statement of Inventorship on Patents Form 7/77 will need to be filed (see Rule 15).***

⑧ *Please supply duplicates of claim(s), abstract, description and drawing(s).*

⑧ Checklist

8a Please fill in the number of sheets for each of the following types of document contained in this application.

Continuation sheets for this Patents Form 1/77	—		
Claim(s)	3	Description	6
Abstract	1	Drawing(s)	12+12 (Informal)

8b Which of the following documents also accompanies the application?

Please mark correct box(es)

Priority documents *(please state how many)*	—
Translation(s) of Priority documents *(please state how many)*	—
Patents Form 7/77 – Statement of Inventorship and Right to Grant *(please state how many)*	—
Patents Form 9/77 – Preliminary Examination/Search	1
Patents Form 10/77 – Request for Substantive Examination	—

⑨ *You or your appointed agent (see Rule 90 of the Patents Rules 1990) must sign this request.*

⑨ Request

I/We request the grant of a patent on the basis of this application.

Please sign here ⇨

Signed Marks & Clerk Date 15-6-99 (day month year)

A completed fee sheet should preferably accompany the fee.

Please return the completed form, attachments and duplicates where requested, together with the prescribed fee to:

☐ ***The Comptroller***
The Patent Office
Cardiff Road
Newport
Gwent
NP9 1RH

or

☐ ***The Comptroller***
The Patent Office
25 Southampton Buildings
London
WC2A 1AY

M&C Folio: 230P80667 Document #: 382124

Load Carrying Body

This invention relates to a load carrying body for a vehicle, in particular for the purpose of facilitating the unloading of material.

Conventionally, material such as earth, stones, rock, coal, or refuse is unloaded from a tipping body, in a manner which is difficult to control.

Ejector bodies are known in which material is pushed out of the body without tipping the body.

Such systems cannot deal with a variety of loads and body lengths.

The present invention provides a load carrying body with a flexible floor which is winched out of the rear end portion of the body.

Preferred features of the load carrying body are set forth in the claims.

The invention will be described further, by way of example only, with reference to the accompanying drawings.

In the accompanying drawings:

Figure 1 is a partial side view of an articulated vehicle having a trailer with a load carrying body in accordance with the invention, carrying a full load;

Figure 2 is a view similar to Figure 1, but with the load partly ejected;

Figure 3 is a view similar to Figure 1, but with the load fully ejected;

Figure 4a is a perspective view of the body, corresponding to Figure 1;

Figure 4b is a perspective view of the inverted body, corresponding to Figure 4a;

Figure 4c is an enlargement of detail 4c in Figure 4b;

Figure 4d is an enlargement of detail 4d in Figure 4b;

Figures 5a -d are similar to Figures 4a - d, but corresponding to Figure 2;

Figure 6a - d are similar to Figures 4a- d, but corresponding to Figure 3;

Figure 7 is an axial section through a winch and its mounting to the base of the load carrying body;

Figure 8 is a perspective view from below, showing one end part of a belt and the winch;

Figure 9 is a perspective view from below, showing the other end part of the belt and a headboard;

Figure 10 is an enlarged section through a connection between the belt and the headboard; and

Figure 11 is a diagram of a hydraulic circuit of the vehicle.

The articulated vehicle illustrated in Figure 1 comprises a tractor unit 11, including a cab and an internal combustion engine (not shown), and a trailer 12, including a load carrying body or ejector body 13 which has a base 14, fixed sidewalls 16, a movable transverse member or headboard 17 at the front end, and an upwardly swingable tailgate 18 at the rear end. As shown in Figure 1, the body 13 is in an initial fully-laden condition and contains loose material 19 such as sand or aggregate.

The headboard 17 is movable along the upper surface of the base 14 between a front position (Figures 1, 4a, and 4b) and a rear position (Figures 3, 6a, and 6b). It has

wear pads 21 which run against the upper surface of the base 14 and the inner surfaces of the sidewalls 16. The tailgate 18 is self-locking and, when unlocked, can be opened by means of hydraulic rams 22 or alternatively by the material 19 as it is ejected.

The floor of the load space between the headboard 17 and the rear end of the body 13 is constituted by a flexible belt 23 which rests on the substantially flat approximately horizontal upper surface of the base 14 and occupies the full width of the load space between the sidewalls 16. The belt is made of a hard wearing non-stretchable material, such as that used for conveyor belts in mining installations, for example. The front end of the belt 23 is releasably connected to the underside of the headboard 17 as shown in Figures 9 and 10. A transverse series of projections 24 provided in the form of circular annular steel discs cross-welded to a bottom wall of the headboard 17. The projections 24 fit in corresponding holes 26, e.g. 50 mm in-diameter, in the end portion of the belt 23, the belt being retained by bolts 27. The other end of the belt 23 passes over the rear end of the base 14 and is connected to a winch 28 lying below the level of the upper surface of the base 14.

The winch comprises a drum 29 having a hollow cylindrical peripheral wall 31 which extends over the full width of the load space and on which the belt 23 is wound. The outer surface of the cylindrical wall 31 is provided with a series of projections 24 (as described above) which fit in a series of holes 26 (as described above) provided in the adjacent end of the belt 23 (Figure 8).

One end of the drum 29 is constituted by a sheave 32 on which is wound a cable 33 in the form of a steel wire rope, for example. The cable 33 is guided along a path as shown in the drawings by a guide system comprising rotatable guide elements or pulleys 34 to 39 and is connected to a lug 41 on the headboard 17 at a position substantially on the centre-line of the body 13.

The winch 28 has a reversible hydraulic motor 42 mounted in an annular frame 43 freely fitted in the end of the drum 29 opposite to the end closed by the sheave 32,

which is mounted on an axle 44 by bearings 46 within the drum 29 and thereby kept out of contact with the loose material. The hydraulic motor 42 drives reduction gearing 47 bolted to the inside of the cylindrical wall 31 of the drum 29. The drum rotates about a horizontal axis 48 which extends transversely to the centre-line of the body 13 and which is defined by the bearings 46 and bearings (not shown) within the reduction gearing 47. The frame 43 and the axle 44 are fixed to perspective pivot arms 49 mounted on respective pivots 51 which are in turn mounted on flanges 52 fixed to the base 14.

To unload the fully laden trailer 12, the tailgate 18 is raised by means of the hydraulic rams 22 and the hydraulic motor 42 is operated to drive the drum 29 of the winch 28 in the clockwise direction as viewed in Figure 1. The belt 23 is wound on to the winch, thereby drawing the floor of the load space towards the rear end of the base 14. The belt 23 thus carries the loose material 19 out of the rear end of the body 13 and deposits it as a gradually rising heap behind the trailer 12, as shown in Figures 2 and 3. The headboard 17, which is drawn along with the belt 23, merely serves to prevent forward spillage. Compressed air (or another fluid under pressure) can be injected under the floor in order to reduce friction between the belt 23 and the upper surface of the base 14, which may be of steel or aluminium, for example. The supply of compressed air may be discontinued after the floor has started to move or may be continued until the load has been completely discharged. Compressed air injection orifices 53 are provided in an array extending along and across the base and can be connected to piping (not shown) communicating with a compressor (not shown) driven by the engine of the vehicle. Loose material adhering to the surface of the belt 23 is removed by a spring-loaded scraper 54 which bears against the outer surface of the belt as it is wound on and off the winch.

As the winch 28 rotates in the clockwise direction and takes up the belt 23 on the drum 29, the sheave 32 pays out the cable 33 so that the headboard 17 is free to be drawn along the body 13 by the belt 23. When the motor 42 is reversed, the winch drum 29 pays out the belt 23 while the cable 33 is wound on to the sheave 32, thereby

causing the cable to draw the headboard 17 (and with it the belt 23) towards the front end of the base 14. It will be appreciated that the belt diameter on the drum 29 will normally differ from the cable diameter on the sheave 32. In particular, as the belt is wound on the drum, the belt diameter will gradually increase. On the other hand, since the turns of cable on the sheave 32 will normally lie next to one another, the cable diameter on the sheave will remain approximately constant. In order to compensate for the varying difference between the belt diameter and the cable diameter on the winch, the guide system for the cable 33 includes a compensating mechanism which varies the path of the cable during rotation of the winch 28. The compensating mechanism comprises a hydraulic cylinder 56 which drives a piston 57 carrying the pulley 36, around which the cable 33 turns through 180°. The hydraulic cylinder 56 is hydraulically linked to the hydraulic circuit of the motor 42, as shown in Figure 11, so that the hydraulic pressure in the cylinder 56 is controlled to maintain the tension in the cable 33 approximately constant.

Referring to Figure 11 in more detail, a hydraulic pump 58 is driven by a power take off from the engine of the vehicle, and the supply of hydraulic fluid from the pump 58 to the hydraulic motor 42 is controlled by a directional control valve 59, which is shown in the "off" position and which has two "on" positions for driving the motor 42 (and hence the winch 28) in opposite directions. The supply of hydraulic fluid pressure to the cylinder 56 is controlled by two valves 61,62. The control valve 61 is effective to control the cable tension as the cable 33 is unwound from the winch during the ejection of the loose material, and the control valve 62 is effective to control the cable tension during the winding of the cable 33 on to the winch 28 during retraction of the headboard 17 towards the front end of the load carrying body 13. The control valves 61,62 act in such a way as to keep the pressure acting on the piston 57 substantially constant. Thus, slackness in the cable 33 and in the belt 23 is avoided during the unloading of the loose material and the paying off of the belt from the winch.

During use, the wear on the belt 23 is uneven, gradually increasing from the end connected to the winch drum 29 towards the end connected to the headboard 17. The above-described connection of the belt ends to the drum and the headboard by means of the projections 24 and holes 26 provides the advantage that the worn belt can be turned round end to end in order to increase its useful life.

The ejection and retraction times are equal and typically can be set at 500 mm/s, which equates to 16 seconds for a load space 8 m long. The loose material can be ejected with the vehicle stationary or moving forwards or in reverse. It is easy to control ejection of only a portion of the loose material. The use of the body 13 is not restricted to the carrying of loose material, since the movable floor can assist in the loading and unloading of rigid loads such as palletised loads, for example, in conjunction with a fork lift truck or telescopic material handler.

CLAIMS:

1. A load carrying body for a vehicle, comprising:

(a) a load-bearing base having front and rear ends;

(b) a transverse member which is movable along the upper surface of the base between a front position and a rear position;

(c) a reversible winch mounted to the base, the winch lying below the level of the upper surface of the base;

(d) a floor constituted by a flexible belt which rests on the upper surface of the base, a first end of the belt being connected to the transverse member and a second, opposite end of the belt being connected to the winch so that rotation of the winch in a first direction winds the belt on to the winch, thereby drawing the floor and with it the transverse member towards the rear end of the base, and rotation of the winch in a second, opposite direction pays out the wound belt from the winch;

(e) a cable having one end connected to the transverse member and the other end connected to the winch so that rotation of the winch in the said second direction winds the cable on to the winch; and

(f) a guide system which guides the cable along a path such that rotation of the winch in the said second direction causes the cable to draw the transverse member and with it the floor towards the front end of the base, the guide system including a compensating mechanism which varies the path of the cable during rotation of the winch, so as to compensate for a difference between the belt diameter on the winch and the cable diameter on the winch, the difference varying as the belt is wound and unwound.

2. A load carrying body as claimed in claim 1, in which the winch is mounted so as to be pivotable relative to the base about a transverse pivot axis parallel to the winch axis.

3. A load carrying body as claimed in claim 1 or 2, in which the winch comprises a drum around which the belt is wound, one end of the drum constituting a sheave around which the cable is wound.

4. A load carrying body as claimed in claim 3, in which the winch includes a hydraulic motor at the other end of the drum.

5. A load carrying body as claimed in claim 4, in which the hydraulic motor drives the drum via reduction gearing within the drum.

6. A load carrying body as claimed in any of claims 3 to 6, in which the drum rotates about bearings within the drum.

7. A load carrying body as claimed in any preceding claim, in which the belt is releasably connected to the transverse member and to the winch so that the belt can be turned round end-to-end.

8. A load carrying body as claimed in claim 7, in which each end of the belt has a transverse series of holes which receive corresponding projections provided on the transverse member and the winch respectively.

9. A load carrying body as claimed in any preceding claim, including a scraper which bears against the outer surface of the belt as it is wound on and off the winch.

10. A load carrying body as claimed in any preceding claim, in which the compensating mechanism comprises a guide element around which the cable turns along the said path and a piston-and-cylinder device for moving the guide element to vary the said path.

11. A load carrying body as claimed in any preceding claim, in which the base has orifices for injecting fluid under pressure between the floor and the base in order to reduce friction.

12. A load carrying body substantially as described with reference to, and as shown in, the accompanying drawings.

ABSTRACT:

Load Carrying Body

A transverse member or headboard 17 is movable along the upper surface of a load-bearing base 14. A reversible winch 28 is mounted to the base 14, below the level of its upper surface. A floor constituted by a flexible belt 23, resting on the upper surface of the base, has one end connected to the headboard 17 and the other end connected to the winch 28 so that rotation of the winch one direction winds the belt on to the winch, thereby drawing the floor and with it the headboard 17 towards the rear end of the base, and rotation in the opposite direction pays out the wound belt from the winch. A cable 33 has one end connected to the headboard 17 and the other end connected to the winch 28. A guide system (34 to 39) guides the cable 33 along a path such that rotation of the winch in the direction to pay out the belt 23 causes the cable 33 to draw the headboard 17 and with it the floor towards the front end of the base 14. The guide system includes a compensating mechanism (36, 56, 57) which varies the path of the cable 33 during rotation of the winch 28, so as to compensate for a difference between the belt diameter and the cable diameter on the winch, the difference varying as the belt is wound and unwound.

(Fig. 4b)

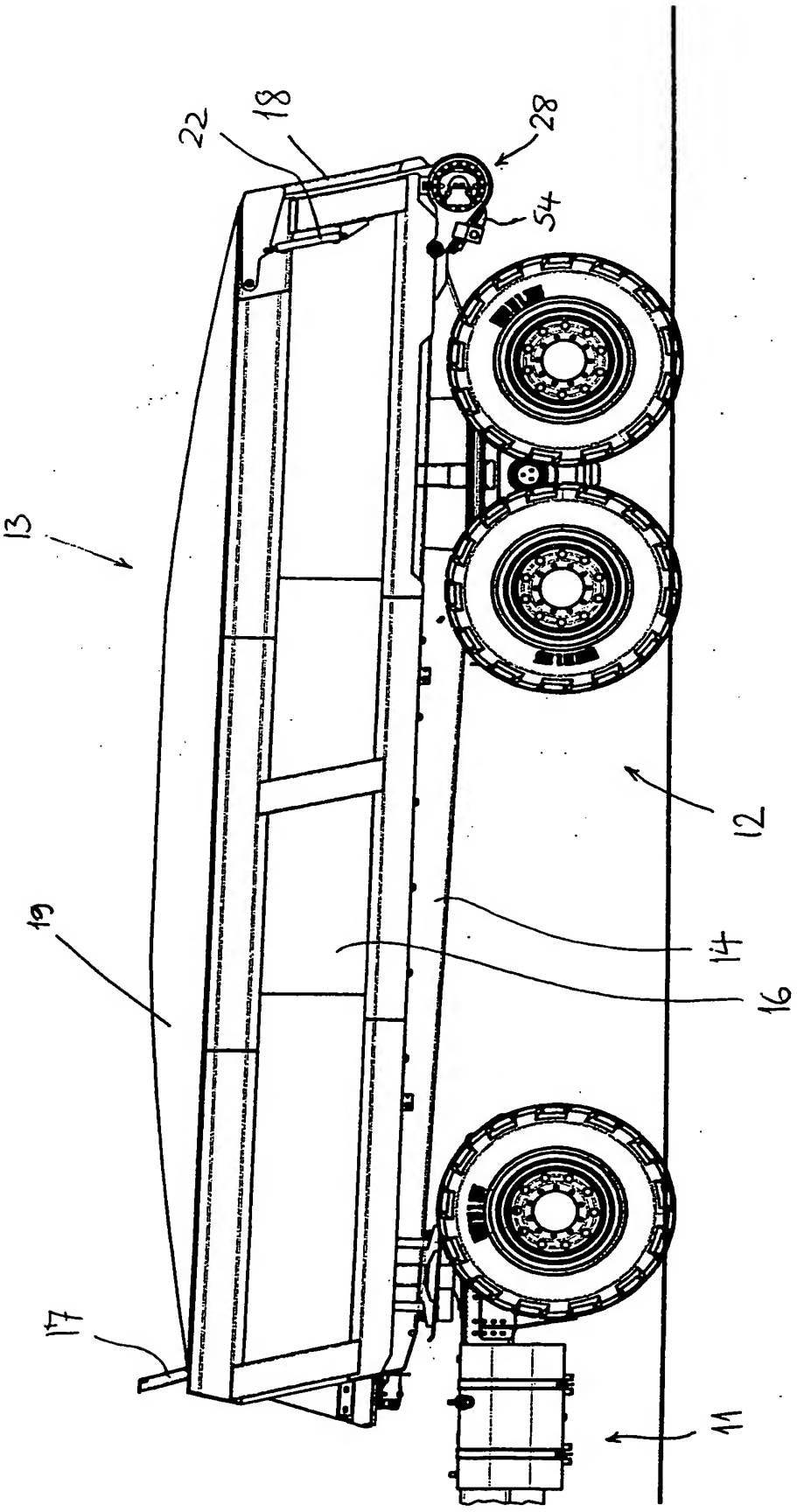

Fig. 1

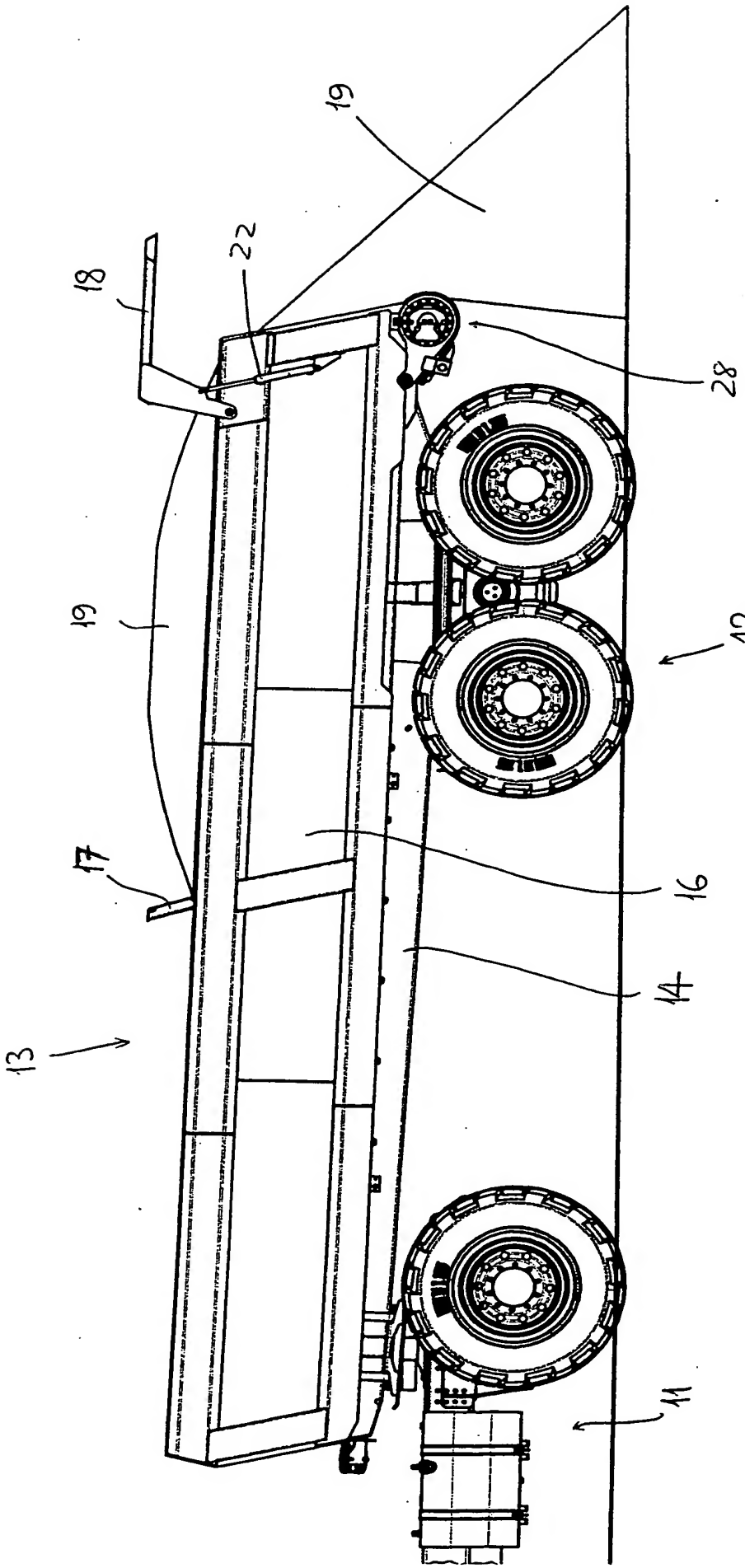

Fig. 2

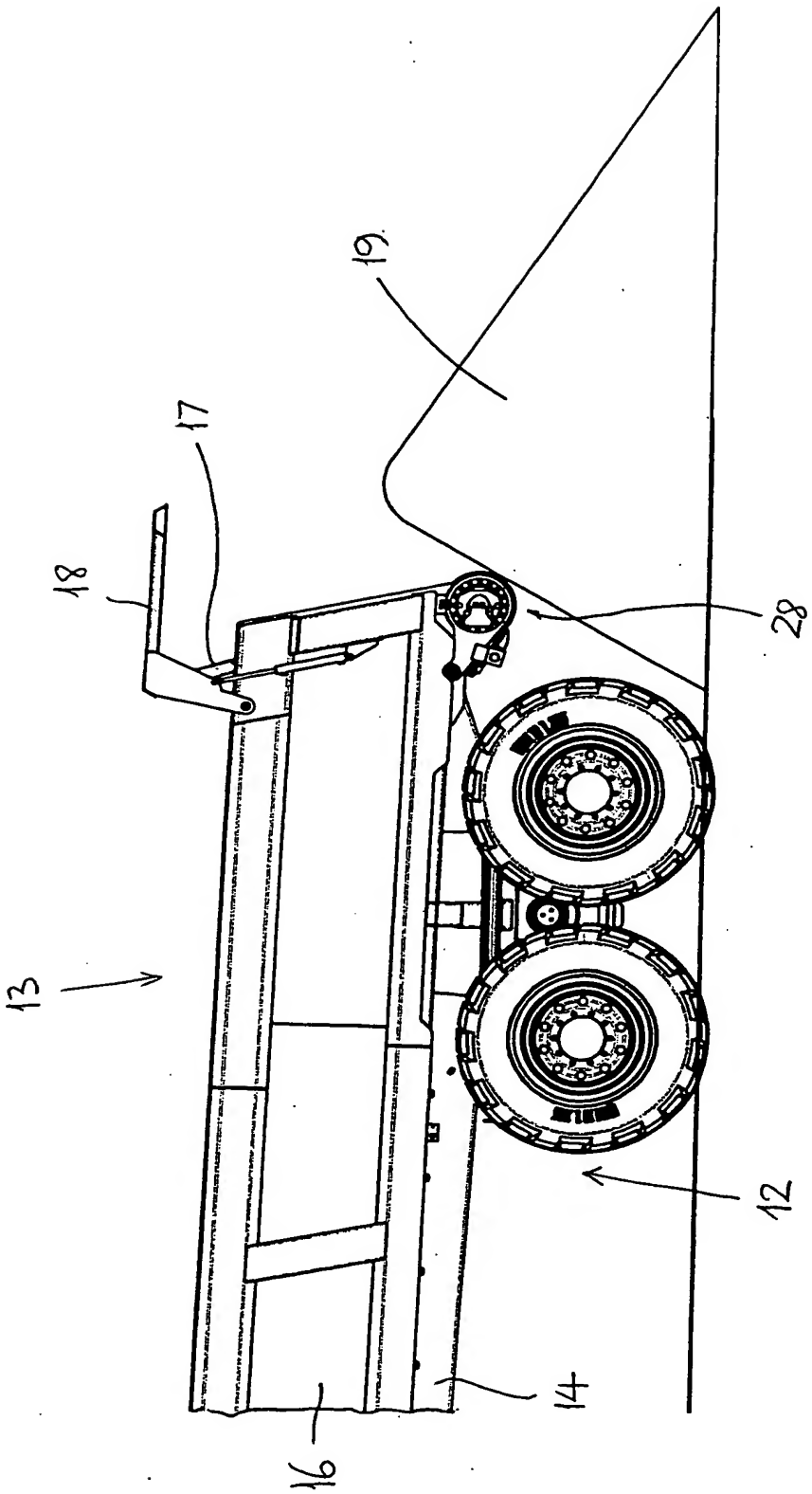

Fig. 3

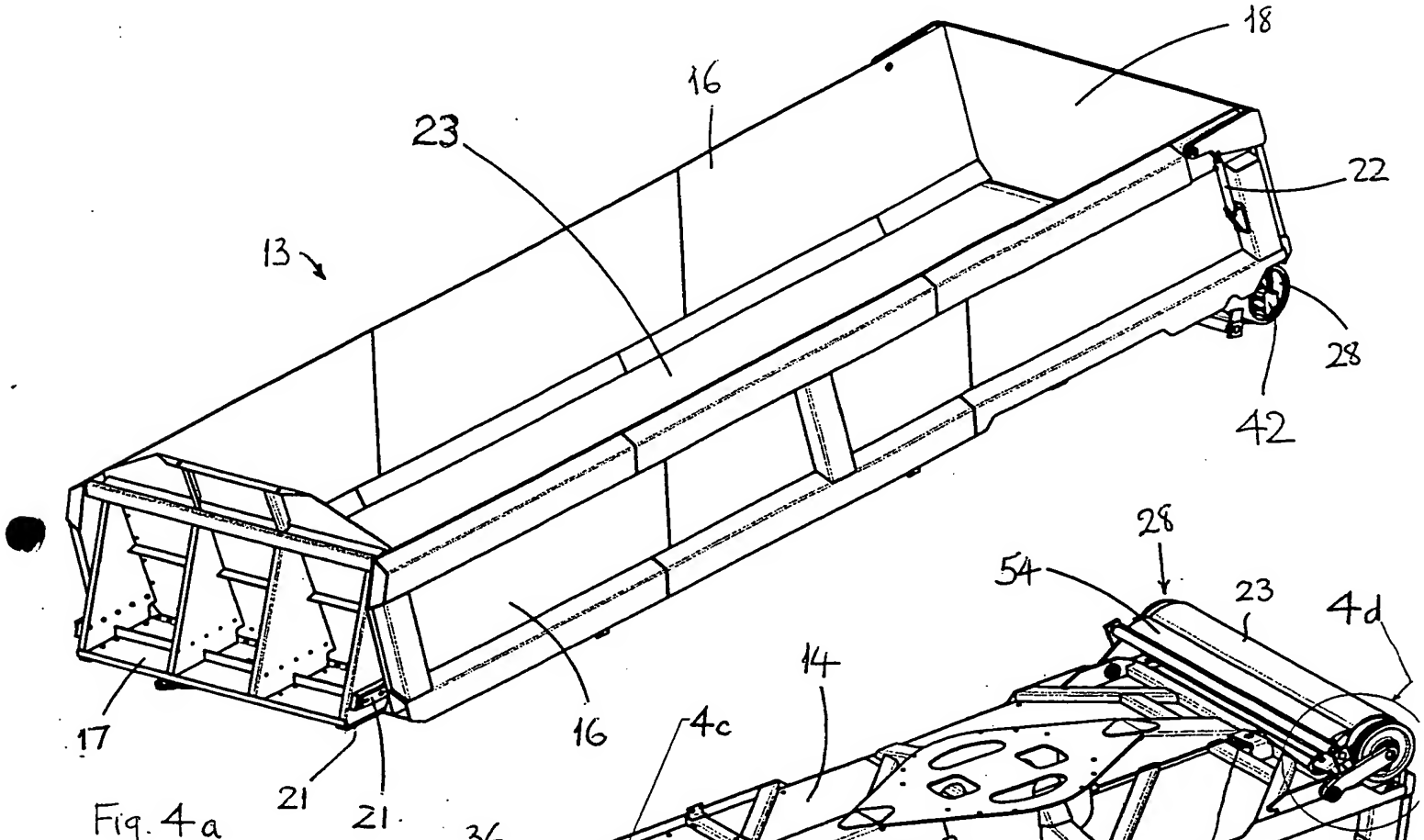

Fig. 4a

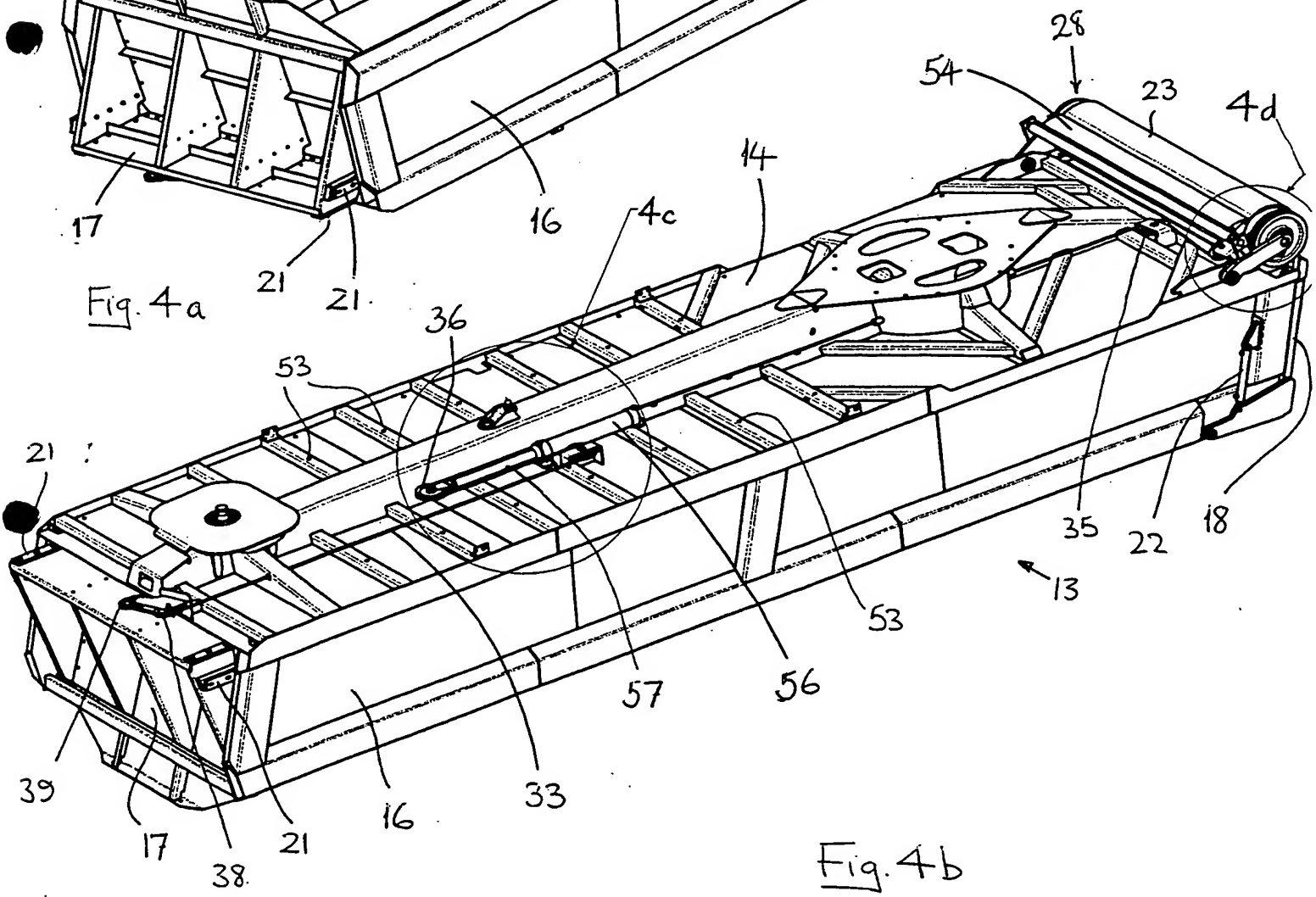

Fig. 4b

INITIAL POSITION

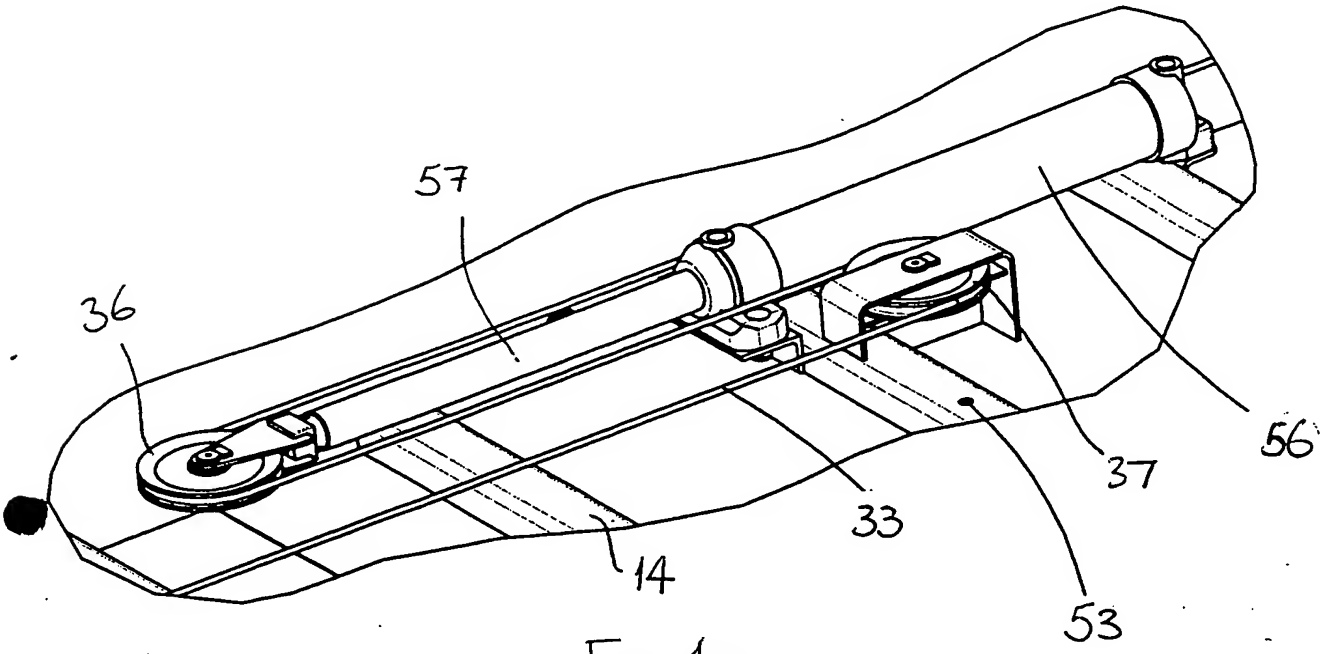

Fig. 4c

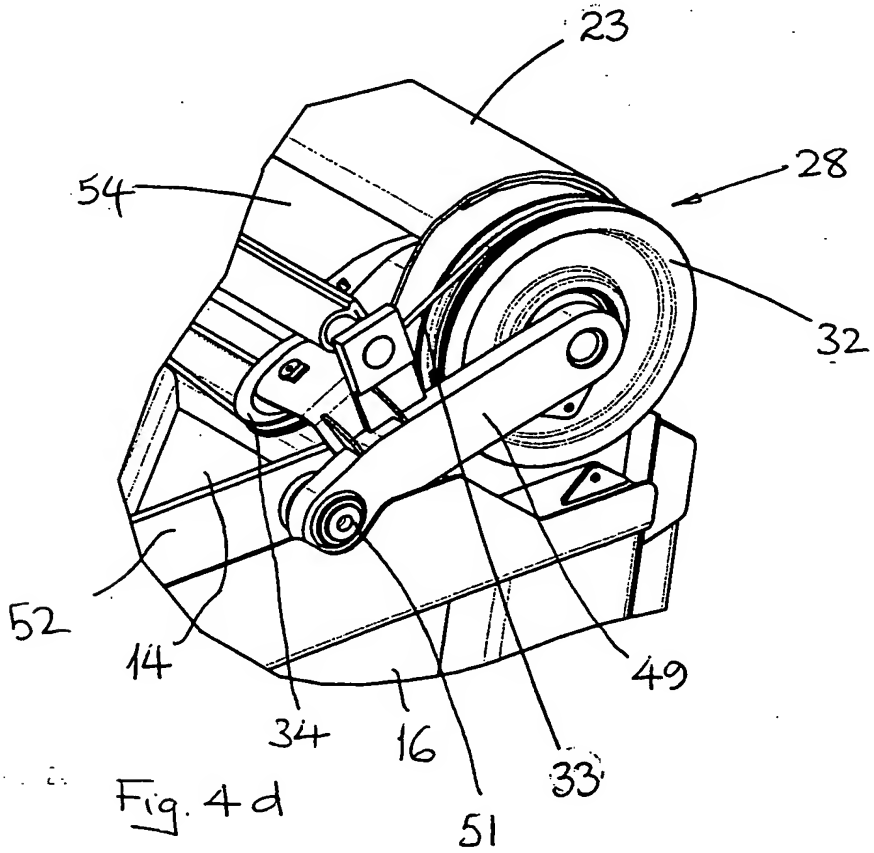

Fig. 4d

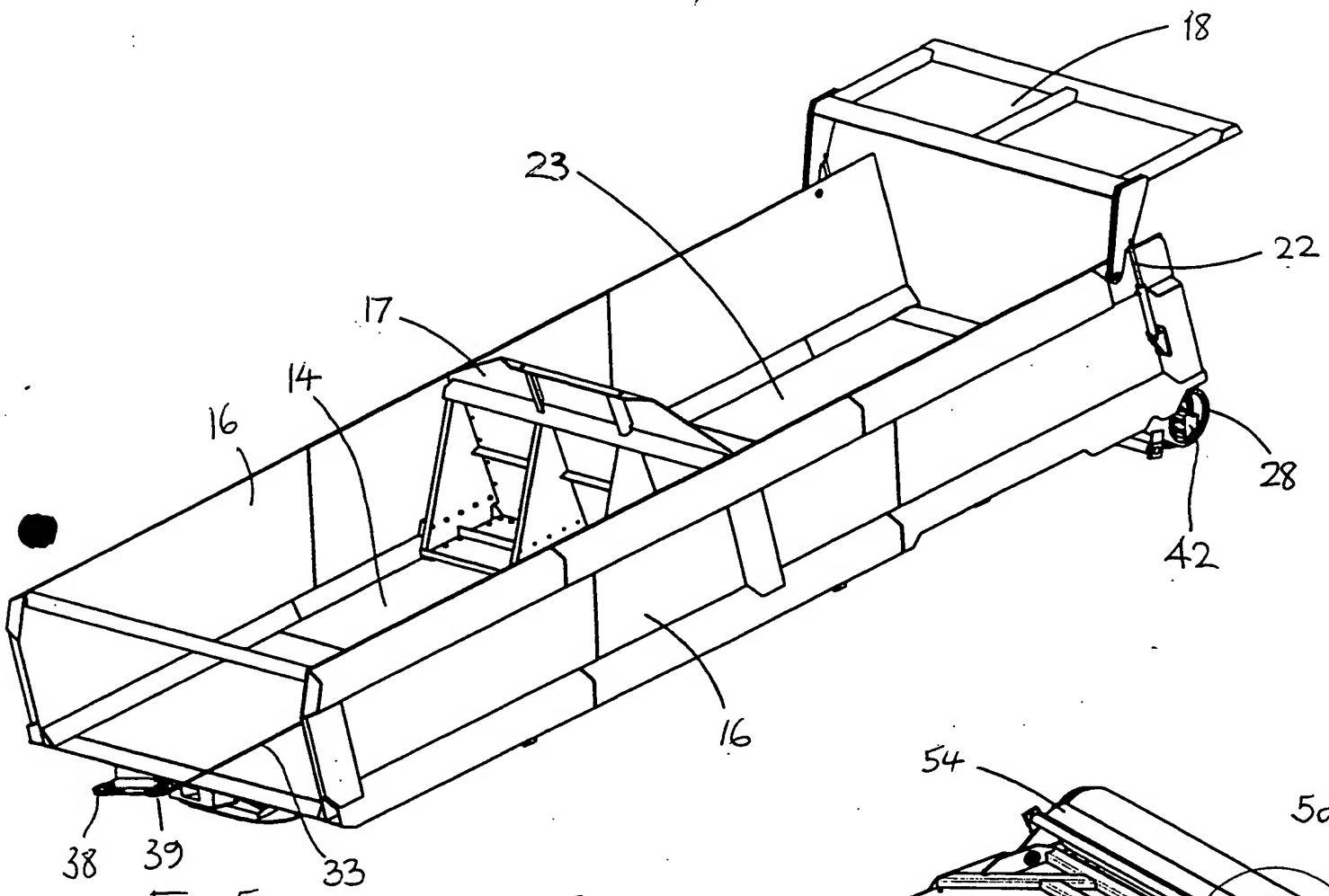

Fig. 5a

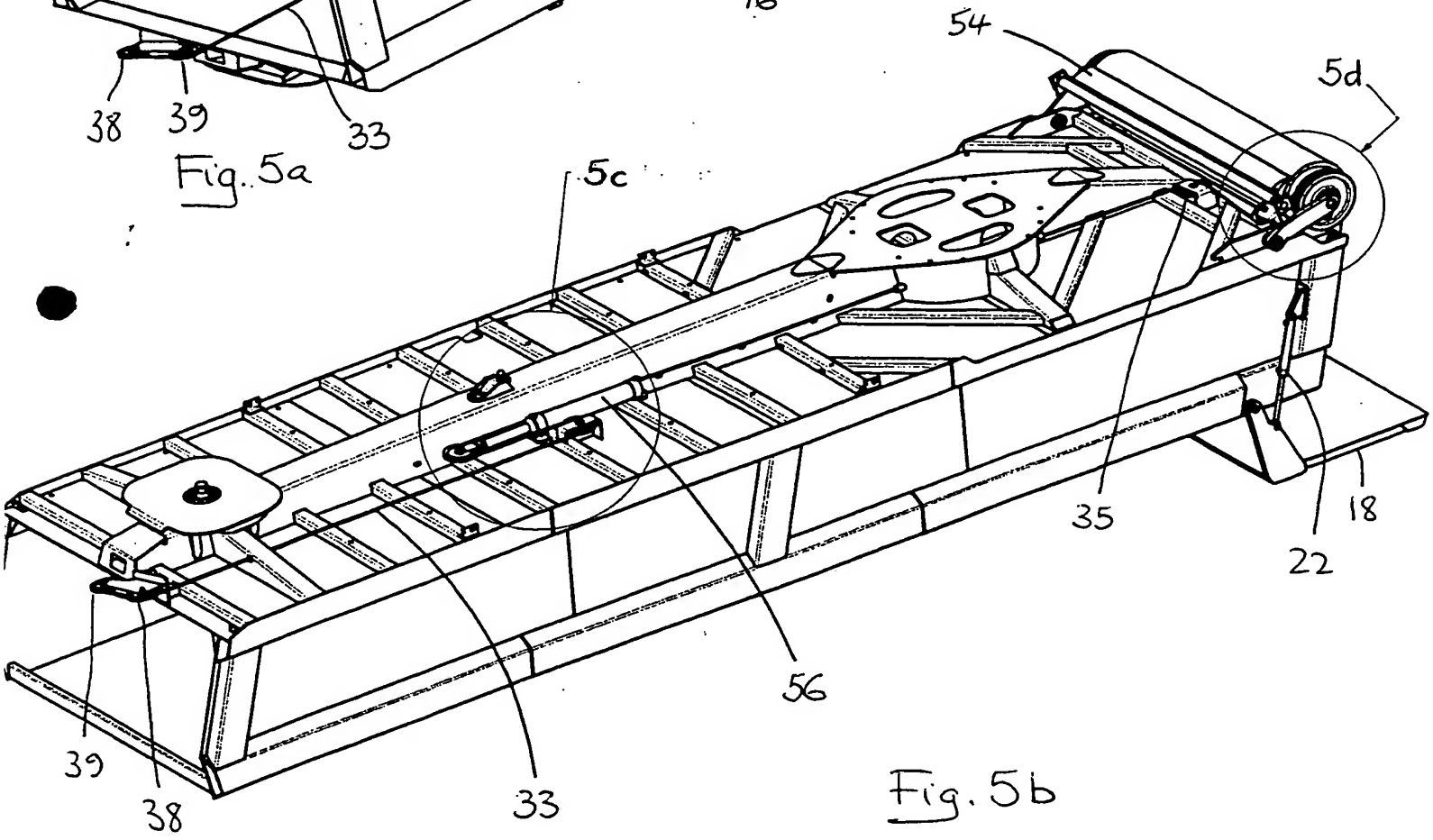

Fig. 5b

MIDDLE POSITION

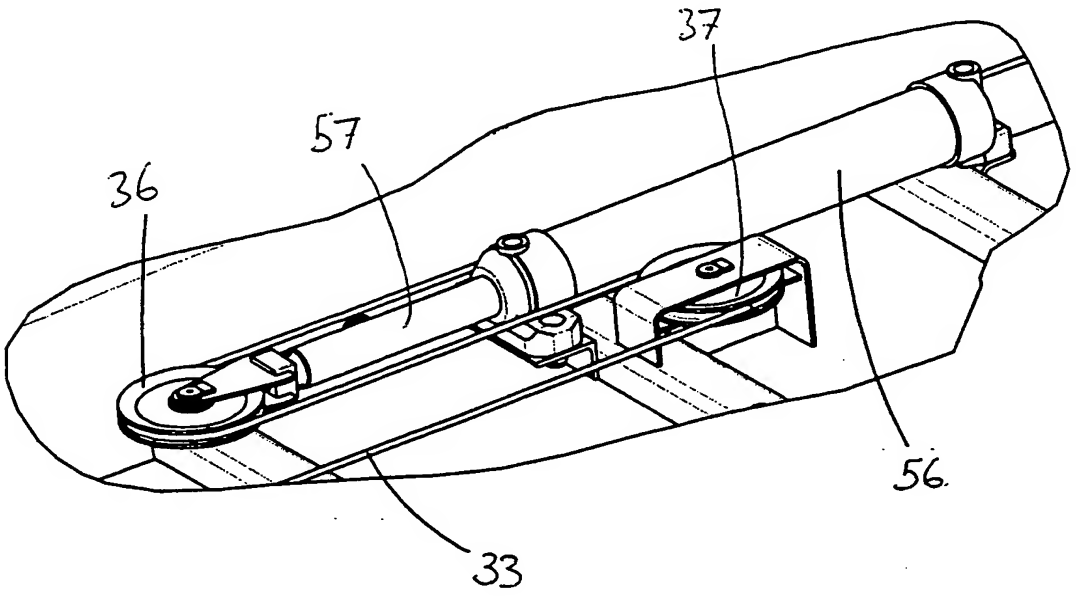

Fig. 5c

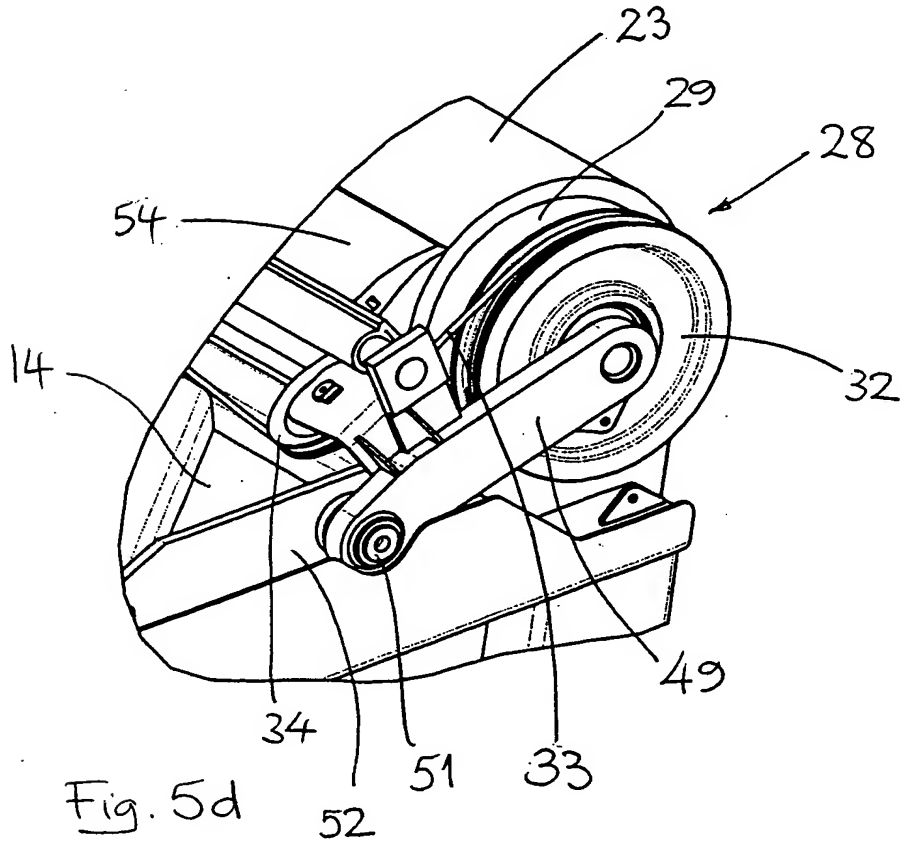

Fig. 5d

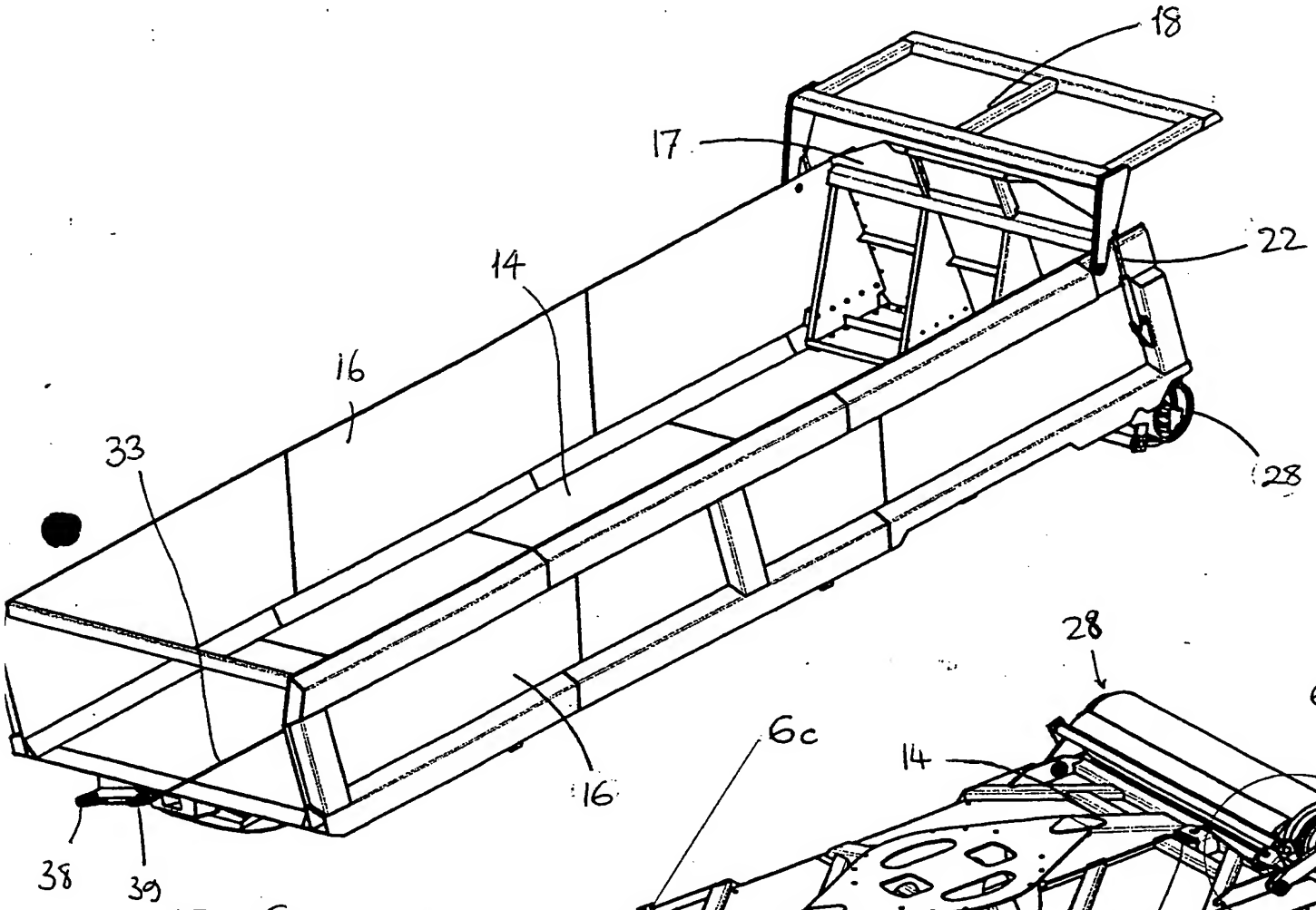

Fig. 6a

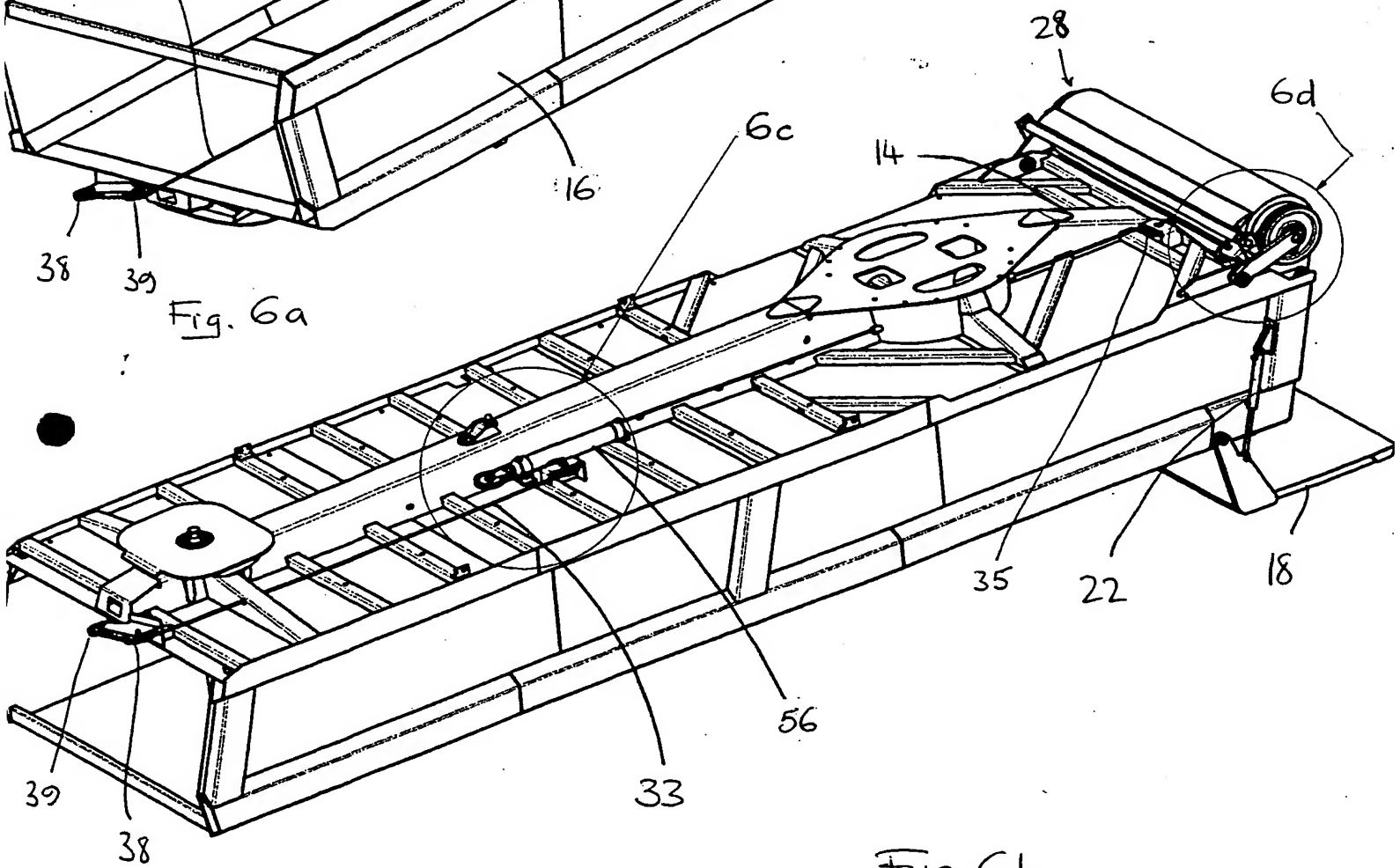

Fig. 6b

FINAL POSITION

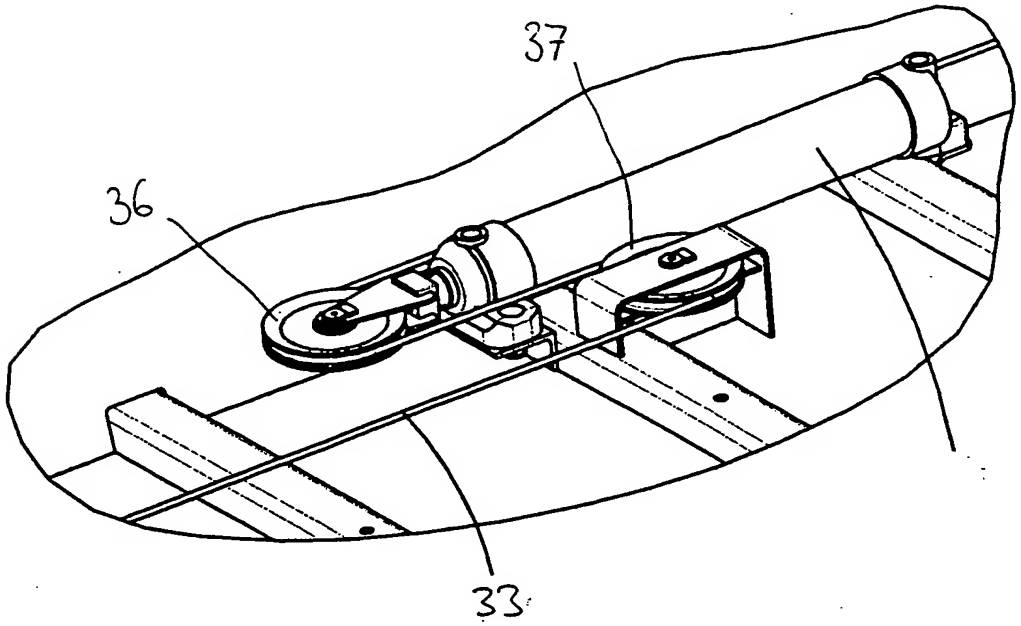

Fig. 6c

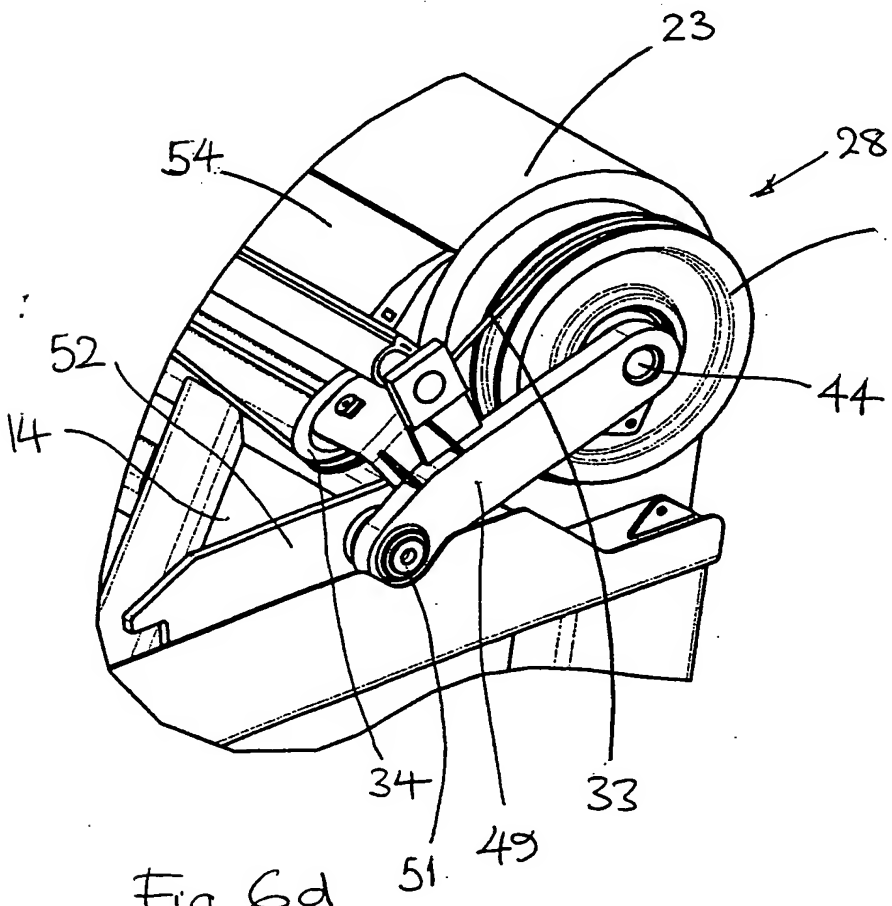

Fig. 6d

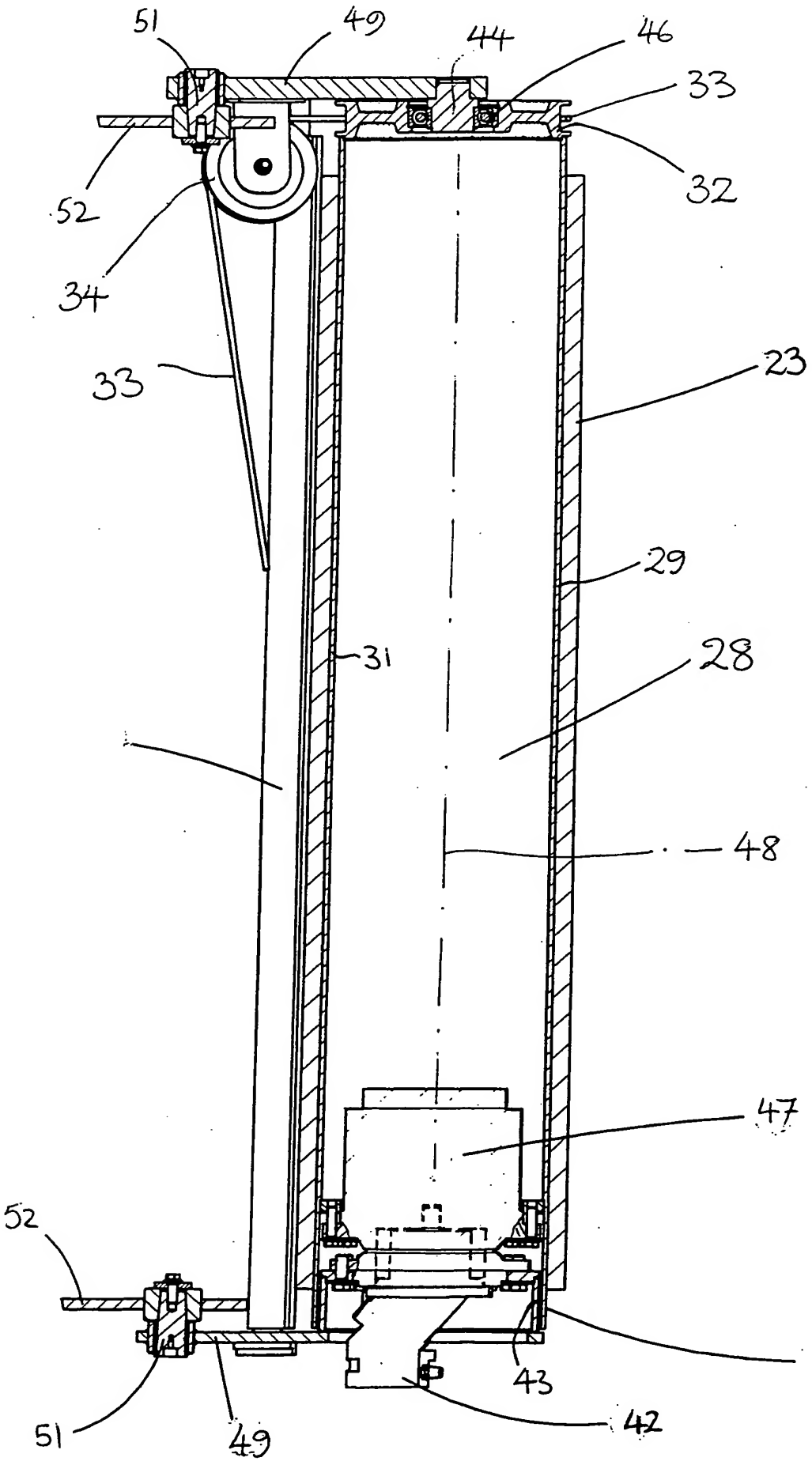

Fig. 7

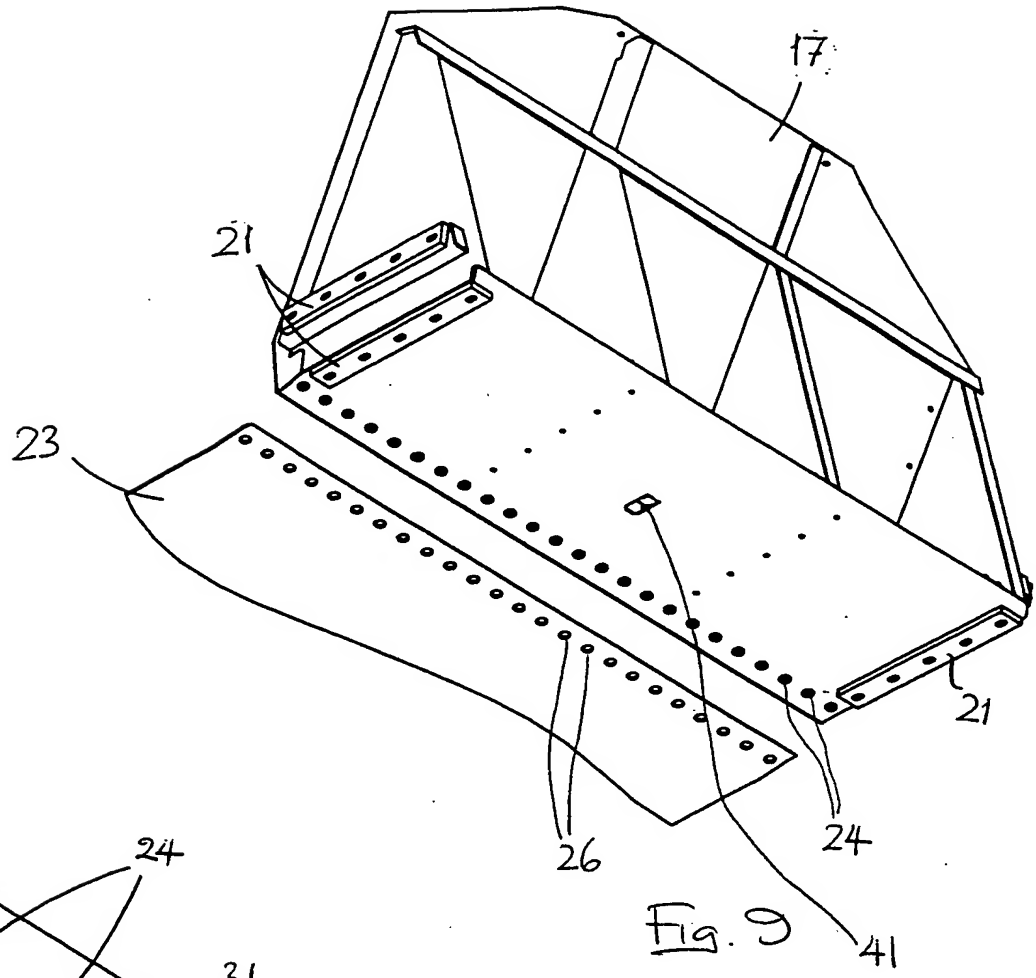

Fig. 9

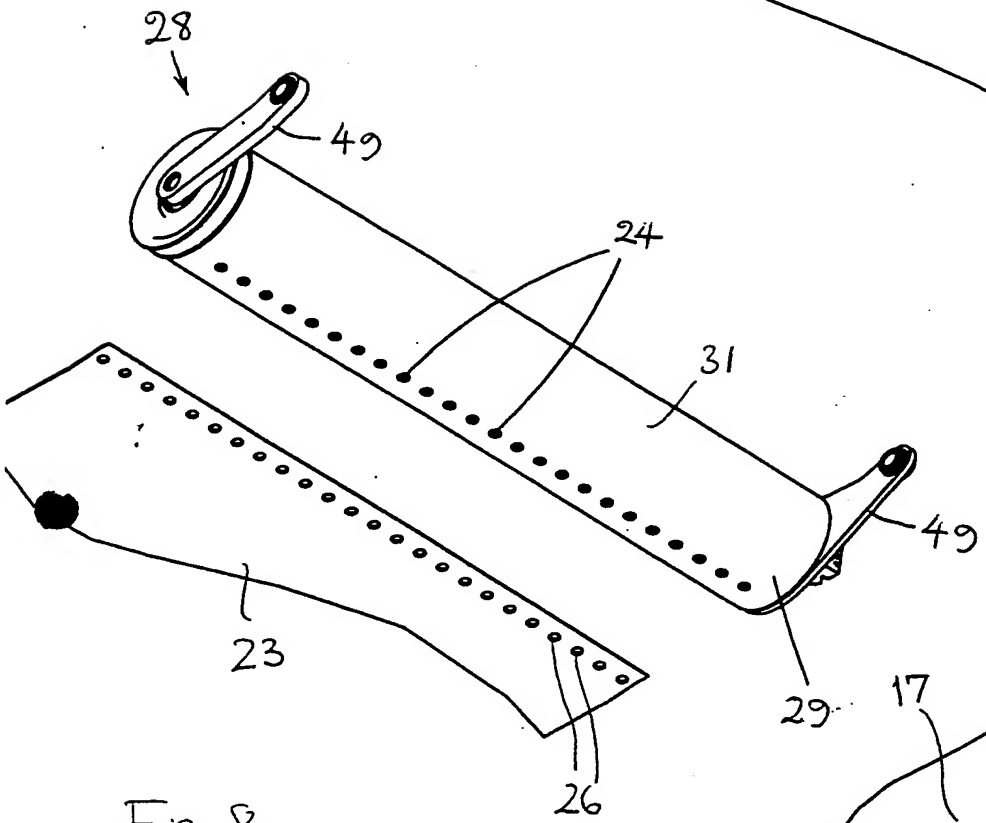

Fig. 8

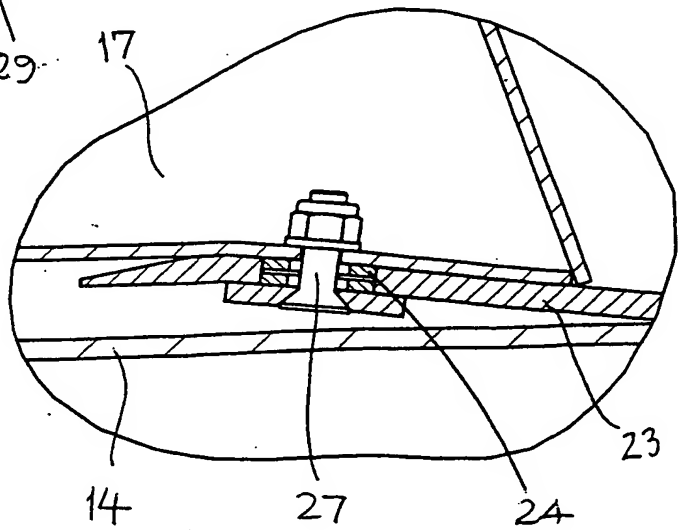

Fig. 10

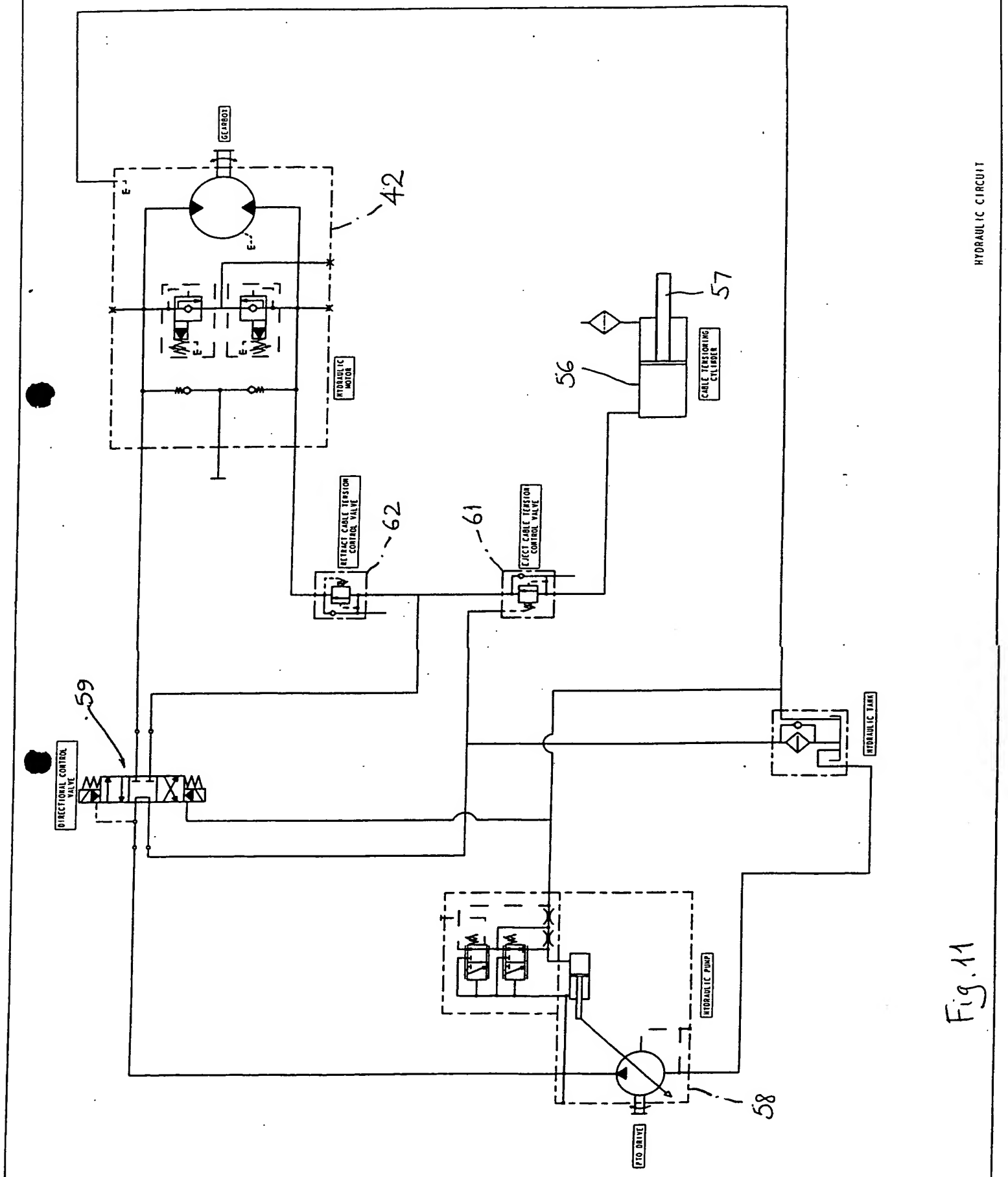
HYDRAULIC CIRCUIT
GEARBOX
42
HYDRAULIC MOTOR
57
56
CABLE TENSIONING CYLINDER
RETRACT CABLE TENSION CONTROL VALVE
62
EJECT CABLE TENSION CONTROL VALVE
61
59
DIRECTIONAL CONTROL VALVE
HYDRAULIC TANK
HYDRAULIC PUMP
58
PTO DRIVE

Fig. 11

PCT/GB00/02277.
Marks + Clerk.
13-6-00.